BAP-C202
ENGINEERING PHYSICS

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT –I

Wave & Oscillations: Simple harmonic motion, damped and forced simple harmonic oscillator, Mechanical and electrical simple harmonic oscillators, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators, electrical and mechanical impedance, steady state motion of forced damped harmonic oscillator, power absorbed by oscillator.

UNIT –II

Quantum Mechanics: Introduction to quantum physics, black body radiation, explanation using the photon concept, photoelectric effect, Compton effect, de Broglie hypothesis, wave-particle duality, Born's interpretation of the wave function, verification of matter waves, uncertainty principle, Schrodinger wave equation & its solution for particle in box

UNIT –III

Electrostatics : Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential and uniqueness of their solution and connection with steady state diffusion and thermal conduction; Practical examples like Farady's cage and coffee-ring effect; Boundary conditions of electric field and electrostatic potential; method of images with simple examples , energy of a charge distribution and its expression in terms of electric field.

UNIT –IV

Magnetostatics & LASERS: Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution for given current densities.

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby laser, He-Ne and CO2 laser, properties and applications of lasers.

UNIT –V

Electronic materials: Free electron theory of metals, quantum theory of free electrons, Fermi level, Density of states, Energy bands in solids, Direct and indirect bandgaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level,

Semiconductors: Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), concentration of charge carriers, Carrier generation and recombination, Carrier transport: diffusion and drift in p-n junction.

Text Books / References

1.I.G. Main, Vibrations and Waves in Physics, Cambridge University Press (1993).

2. H. J. Pain, The Physics of Vibrations and waves, Wiley India Pvt., Ltd. 6th Edition (2010).

3. David Griffiths, Introduction to Electrodynamics, Pearson Education India Learning Private Ltd. 4th Edition (2015).

4. Halliday, Resnick, Walker, Fundamental of Physics, Wiley India Pvt. Ltd; 10th Edition (2015).

5.W. Saslow, Electricity, magnetism and light, Academic Press, 1th Edition (2002).

6. E. Hecht, Optics, Pearson Education, India, 4 th Edition (2008).

7. A. Ghatak, Optics, Tata McGraw-Hill Education India, 5 th Edition (2012).

8. O. Svelto, Principles of Lasers, Springer Science & Business Media (2010).

9. D.J. Griffiths, Quantum Mechanics, Pearson Education (2014).

10. R. Robinett, Quantum Mechanics, OUP Oxford (2006).

11. L.I. Schiff, Quantum Mechanics, Tata McGraw-Hill Education Pvt. Ltd, 4th Edition (2014)

12. D.A. Neamen, Semiconductor Physics and Devices, Times Mirror High Education Group, Chicago (1997).

13. E.S. Yang, Microelectronic Devices, McGraw Hill, Singapore (1998).

14. B. G. Streetman, Solid State Electronic Devices, Prentice Hall of India (1995).

15. K. Charles, Introduction to Solid State Physics, John Wiley, Singapore, 7th Edition (1996).